Microbial Characterization of Saline Fissure Water from an Arctic Au Mine

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The world's Au mines have been previously used to study the microbial community composition of the deep terrestrial subsurface. In particular, our research team used the ultra-deep Au mines of South Africa to characterize sequestered microbial communities through molecular and geochemical methods, in an ongoing NASA/NSF-funded project. The collected data highlighted the importance of investigating these extreme environments as analogs for extraterrestrial systems. The Arctic Au mine, Lupin, provided an unparalleled window of opportunity to commence similar investigations in a psychrophilic, Mars-like environment. Fissure water was collected from four subsurface sampling sites situated within or below the ~500m thick permafrost during a week-long expedition in May of 2004. An intensive enrichment strategy yielded eight positive cultures from various sites, including both psychrophilic chemoheterotrophs and sulfate-reducers. Confocal scanning laser microscopy (CSLM) using both nucleic acid and lipid membrane stains revealed co-cultures of cocci and long filamentous chains ranging in size from 1 to 40μm. The phylogenetic diversity of the samples and enrichments was assessed through construction of 16S rDNA evolutionary trees and related to the general geochemistry of the fissure waters.